SCIENCE & GOVERNMENT REPORT

17th Year of Publication

The Independent Bulletin of Science Policy

Volume XVII, Number 1 P.O. Box 6226A, Washington, D.C. 20015 January 15, 1987

Science Gains from Economic Fears

'87 Political Setting Is Ripe for an R&D Boom

The New Year brings the prospect of a boom in federal spending on research and science education, not out of political fervor for knowledge, but from desperation about the nation's persistent economic woes.

It has not been firmly established that the volume of research financed from Washington has any effect, one way or the other, on American industrial competitiveness, or that the scientific training of the work force affects innovation, manufacturing quality, or export performance. But the contribution of research and scientific education to all of these is so widely assumed to be important that state governments, eager for advantage, have been going off on their own. In collaboration with their universities and local booster organizations, they have been setting up programs to "incubate" local high-tech firms, and to improve their schools as part of efforts to make their areas more attractive as industrial sites (SGR Vol. XVI, No. 20).

Meanwhile, calls for more federal spending on non-

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military research and development regularly come from the National Governors' Association, the Democratic National Committee, and even from some of the Administration's appointees to senior research positions. Erich Bloch, the Director of the National Science Foundation, is not shy about saying that the federal government should spend another $1 billion to $2 billion a year on research in universities. His close associate in this campaign is Roland Schmitt, GE Vice President and Chief Scientist, who chairs the NSF Board. Hunting money for university science is a growth sector in the Washington lobbying industry.

The last session of Congress produced an unusually heavy volume of legislative proposals specifically linked to the economic benefits of research. Among those that passed was a five-year extension of the Small Business Innovation and Research Act, which requires almost all federal R&D agencies to set aside 1.25 percent of their extramural funds for awards to small business firms.

When the establishment of the SBIR program was debated in Congress in 1982, the Reagan Administration was strongly opposed. And after it got underway, Administration officials regularly sniped at it as misguided spending—"money down the sewer" is how then-White House Science Adviser George A. Keyworth II described the NIH share of the program in 1984. But the SBIR extension easily went through Congress last fall and was quietly signed by the President in October. Small business and research are very much in fashion as bright spots amid the national economic gloom.

Also passed was the Japanese Technical Literature

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In Brief

With the term "peer review" often sneered at on Capitol Hill as shorthand for elitist distribution of research funds, NSF has officially switched to "merit review" to describe its award process. Quality of research and investigators comes first, says Director Erich Bloch in a press release, but "once excellence has been established, additional criteria are applied." These are said to include "contributions to related goals of equity and distribution of resources among institutions and geographic areas."

NSF's terminological maneuver may have been inspired by last spring's Senate pork-barrel fight over university research buildings, in which Senator Russell B. Long (D-La.) incredulously asked, "Are we going to have some peers decide who gets the money?" Long added, "I would rather depend on my colleague on the Appropriations Committee than on one of those peers."

A continuing decline in energy-related research and development is forecast by the Department of Energy, with employment of scientists and engineers in these fields predicted to fall from 57,900 last year to 49,100 in 1991. The forecast is contained in "Manpower Assessment Brief" No. 5, (six pages, no charge), available from DOE Office of Energy Research, Manpower Assessment Program, 1000 Independence Ave. SW, Washington, DC 20585; tel. 202/252-6641.

"What Lies Ahead for Philanthropy?" is the title of a report by James A. Joseph, President of the Council on Foundations. Difficult times, he predicts, because of declining business profits and tax changes. The report (16 pages, $5.00 per copy) is available from Council on Foundations, 1828 L St. NW, Washington, DC 20036; tel. 202/466-6512.

. . . Gramm-Rudman Barely Touched R&D Spending

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Act, which is intended to encourage Americans to keep up with Japanese research publications. The Act went into operation on a skimpy authorization of $1 million scraped up from the National Bureau of Standards, but its main sponsor, Senator John D. Rockefeller (D-W. Va.), is expected to push for an expanded program in the new Congress.

Another piece of economics-inspired research legislation is the Federal Technology Transfer Act, also signed into law in October. The Act amends the long-neglected Stevenson-Wydler Technology Innovation Act of 1980 by lowering barriers to direct research collaboration between government and industrial organizations. It allows government laboratories to accept industrial funds and permits government employes to share in royalties from inventions that are licensed to private firms.

A sense of Congressional interest in research-related activities and science education can be obtained from the titles of some of the bills that were left lingering on Capitol Hill when the 99th Congress adjourned last year: Information Science and Technology Act (HR 744), National Technology Foundation Act (HR 745), Math and Science Education Act (HR 817), National Advanced Technician Training Act (HR 2353), Advanced Technology Foundation Act (HR 2374), Computer Education Assistance Act (S 1276), University Research Facilities Revitalization Act (HR 2823), Technology Education and Extension Act (S 1394), and Technology Education Act (S 1823).

Bills are easy to write and introduce and usually difficult to pass. What's important about this also-ran list is the mass of political interest that it shows in one general subject area. And that interest is growing as Representatives and Senators recognize the political rewards to be had from delivering a piece of science to the folks back home. That, and not much else, was the stimulus for the record-setting crop of special appropriations for laboratory buildings in the last Congress.

A notable fact about federal agency research budgets is that most of them came through the first full year of Gramm-Rudman with very few wounds, and the only plausible explanation for that good fortune is the mounting deification of research as indispensable medicine for the economy.

It's been a long time since Congressional clowns have sought publicity by the formerly surefire tactic of ridiculing research titles. Given the expectations that the public has developed for research, that old ploy would today be regarded as blasphemous. The opportunities for science to hit the US Treasury have probably not been so favorable since Sputnik. With just a bit of public relations finesse, science could be in clover in the New Year.—DSG

Shift Education from NSF?

Reflecting widely held dismay about NSF's slow return to the support of pre-college science education, former Rep. Don Fuqua (D-Fla.) has suggested that Congress consider shifting the science-education responsibility from the Foundation to the Department of Education.

The issue is money, which many Congressmen want to provide in large volume to upgrade teacher training and curriculums in their schools. But to their frustration, NSF has been taking a gingerly approach to its education role, which was wiped out early in the Reagan Administration and then was revived under Congressional pressure.

Fuqua's recommendation is among some 60 proposals that he has personally offered from his observations as Chairman of the Science Policy Task Force of the House Science and Technology Committee.

Science education, at all levels, used to be a major function at NSF. In 1970, education was budgeted for $120 million, while research received $341 million. In the current fiscal year, NSF's education budget stands at $87 million, while the figure for research is $1.4 billion.

Fuqua observes in his valedictory, "Recently, there has been a stirring of educational activity in the NSF, but in the harsh competition for funding, the research component will be totally dominant under any conceivable scenario." Noting that he previously believed that science education could best be managed by NSF, Fuqua added that, given NSF's record, "It may well be that the problem of pre-college science education in the nation is better handled by educators than by research scientists." Fuqua retired at the end of the last session to become an aerospace lobbyist; meanwhile, the Task Force staff remains at work on the official report of the two-year inquiry.

ISSN 0048-9581

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Independently published by *Science & Government Report, Inc.*, twice monthly, except once each in January, July, August, and September. Annual subscription: Institutions, $195.00 (two years, $340.00). Information about bulk and individual rates upon request. Editorial offices at 3736 Kanawha St. N.W., Washington, DC 20015. Tel. (202) 244-4135. Second-class postage at Washington, D.C. Please address all subscription correspondence to Box 6226A, Northwest Station, Washington, DC 20015. SGR is available on University Microfilms International. Claims for missing back issues will be filled without charge if made within six weeks of publication date.

Q&A: With Head of Council of Graduate Schools

With a membership of 390 institutions that produce 95 percent of the nation's doctoral degrees, the Council of Graduate Schools in the US maintains a Washington office that keeps watch on government affairs of interest to its primary constituency —graduate deans. The President of the Council is Julius P. Lapidus, a medicinal chemist who was Dean of the Graduate School at Ohio State from 1974 until he took the Washington position in 1984. Lapidus spoke with SGR Editor Greenberg on December 17. Following is the transcript, edited by SGR.

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***SGR.** On the list of federal funds for research in universities, the same institutions have been in or near the top 25 for decades, and that's causing a lot of friction and political pressure to share the wealth.*

Lapidus. That's something that doesn't turn around quickly. But I think we're in another phase of national development. And that has to do with the role of the states. States are putting a fair amount of money into the development of research capability in universities that have not been in that first tier. That's going to affect this process dramatically, because they're buying faculty and they're putting bucks into research facilities. That is going to broaden the base. Politically, the question then is, how do you broaden the base and say to people who are clearly doing good stuff that we're not going to support your work?

Enough Top Schools?

***SGR.** There are people from the big research universities who come right out and say that we've got enough first-class institutions, and that we shouldn't use our scarce resources to develop more when funds for research are tight.*

Lapidus. We have developed an ethic in this country that, for the most part, comes out of the historic research universities. It says that quality and prestige in institutions are related most directly to the research components of those institutions. So, we educate people and we send them out to other places, and when they go to other places, they say, I want to develop a research program like the one that I came out of. And I want graduate students, laboratories, equipment, and so on.

It's difficult to fault that in some ways. But there's a reaction building to it that has been articulated in the last couple of years through concerns about the undergraduate curriculum. I have talked within the past month to a couple of presidents at smaller institutions who have basically taken the position that we have enough big research universities. They're saying, we think we can really do good undergraduate education here and we're going to put that forth as our priority, and we're not going to be interested in developing more graduate programs. But they also say that that doesn't mean we're not interested in research anymore. They believe that to run a good undergraduate program, they need faculty members actively involved in the scholarship of their fields. What it does mean is no more big programs, no more departments with 30 to 50 graduate students. It means a lot of old-time single investigator stuff, and in some cases, not working with graduate students. In some cases, it means working with undergraduates or working by yourself.

There are a variety of public and private institutions around the country where this is being talked about seriously. I'd rather not name any of these specifically, because a lot of these are in development. In a lot of these cases, it's a controversial point with the faculty. Many of these places hire people from first-class research universities, and the idea of coming into an undergraduate college and doing research in that milieu is one that takes a little getting used to for many people.

NSF Shuns Facilities Role

***SGR.** Have we seen the high water mark for politicking for research facilities?*

Lapidus. No. The question of research facilities will continue on through the new Congress. It's been fairly clear that the National Science Foundation is not really interested in running a facilities program.

***SGR.** NSF has announced that it will consider requests for facilities that are needed for research it supports. But it says only a few applications have come in (SGR Vol. XVI, No. 18).*

Lapidus. I don't believe most investigators would buy into that seriously in terms of saying: here's my research project; now, what we'd like in addition is a building in which to carry it out.

***SGR.** But the second-rank institutions say that without facilities, they can't get research support. There's no federal money for facilities, and that's why they're taking the political route.*

Lapidus. I think there's a lot of justification for it, but a much more rational approach would be to develop a national competitive facilities program. There have been shots at that over the past few years in various legislative proposals. But you run into another problem. It's between faculty and investigators on the one hand and administrators on the other hand. For the most part, faculty investigators are very reluctant to see money diverted from investigator grants to support of facilities. Research administrators say, look, we need new facilities; where are we going to get the money? What's

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. . . New Doctoral Programs Focus on Job Market

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been sorely lacking is any kind of real national perspective on the development of science on a national basis. From a purely political point of view, geographic distribution always is compelling, but I'm concerned about it when it's not done within the context of any understandable, clearly articulated science policy that talks about development for the entire country.

SGR. *In most fields, the boom is over in PhD production.*

Lapidus. The development of new doctoral programs around the country is very, very slow. There are basically two kinds of graduate programs—the research-oriented programs and the practice-oriented programs. The country is kind of saturated at the research level. It's difficult to talk about new doctoral programs in physics or chemistry. But a number of universities, particularly developing universities, and particularly in what they see as growing industrial areas, are talking about different kinds of doctoral programs. They're talking about doctoral programs—some of them not PhDs, but Doctor of something or other—that are pointed at things like information management; they're very heavily practice-oriented toward a given industry. Historically, those kinds of programs have taken place much more at the master's level than at the doctoral level. But it's beginning to creep in.

Degree Inflation

SGR. *Sounds like trade school programs.*

Lapidus. I don't disagree at all. We've been very interested in this, particularly at the master's level, because that's where most of this has taken place. But more and more, it occurs at the doctoral level. You get into a credentialing thing. If you get into a field where everyone has a baccalaureate degree, and you want to differentiate the work force in some way, you go to the master's degree. Once everyone has a master's degree, there is a degree inflation.

There are a lot of programs, mostly master's so far, but also some doctoral programs, that basically are saying, what does someone need to go into a particular job? And let's put together a program to develop that. That's bad graduate education. One of the difficulties is that it's not always clear to the public as to whether these degrees really make any difference, and that leads people to continue to do this. Do the hirers differentiate whether you come out of one these nothing programs or whether you come out of a program with more content? Very often, we seem to be in a situation where the degree certificate, rather than what that degree is supposed to signify, is what's important. People are getting into fields where it doesn't seem to make any difference what the degree is in, as long as they have that particular degree.

SGR. *There's also pressure from the Reagan Administration for universities to do something that's quickly useful for their country, to support economic competitiveness.*

Lapidus. I see universities research operations being pressured increasingly to move away not just from basic research but applied research as well and into development. Universities are lousy places to do development. But a lot of places are doing it, particularly public institutions, in an effort to be responsive to a concept of economic development in their states and particularly to be responsive to local industry.

University-Industry Ties

I've been interested during the last few years in the university-industry relationship, both from the research side and from the education side. On the research side, it's fine to talk about the MIT-Exxon model and the Washington University-Monsanto model. Those look very, very nice; they support broad-based research programs at very strong universities with long track records. They involve major companies that are going to be in business for a long time.

But to say that's the model that's going on in terms of university-industry research is not expressing what's happening at all. Very often, particularly with public universities, and particularly with the less-than-major universities, there is great pressure to do short-term development work in connection with local industry as a way of trying to build that industry in the state.

You can say that's consulting, and universities have always done that. But when we talk about that as the new research relationship between universities and industry, I see that as extremely shortsighted in terms of talking about any kind of long-range economic development. It solves a specific problem, perhaps, but it certainly doesn't have much to do with graduate education. That's not to say that it's not interesting work or that it's not valuable. I think it's the wrong kind of stuff for universities to be doing.

There's a tremendous pressure on universities to do development today. The major research universities have the strength to resist those pressures more strongly than the smaller places that very often are short on bucks and are viewed as part of a local strategy for economic development.

As I've watched the press on this, I see this caution

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. . . Concerns about Decline in Minority Students

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being raised more and more in the last year. There was a time when there was said to be a great rapprochement between universities and industry. And then came some of the questions—what about publication restrictions? And so on. And then came the feeling that we have to be very cautious about this, that when we look closely at some of the things that are happening, we're not so crazy about what we see.

SGR. *The Director of NSF has expressed concern about the declining enrollments of American students in science and engineering and the large proportion of foreign students in these fields.*

Lapidus. Almost never with foreign students is there any question about academic capability. The problems arise primarily when foreign students become teaching assistants and there's a problem about their ability to be understood in the classroom. It's a devastating issue. More and more universities are taking very active stances on that by using tests, like the Test of Spoken English, to get a measure of the individual's ability to communicate in English.

If you look at the science professoriat in this country over the last 70 years, there are some interesting transnational flows. In the early part of this century, a lot of people who got undergraduate degrees in this country then went to Europe for graduate education in the sciences. A second wave was the Europeans, in the thirties and then on through the forties, who were totally educated outside of this country and then came to this country and became part of the science professoriat.

The New Migration

We're now in a third wave, of individuals primarily from Asia and the Middle East, and to some extent from Latin America and Africa. They have their undergraduate education in their home countries and come here for their graduate education, and become part of the professoriat.

One of the things we have a real problem with is the conflict that universities are seeing in terms of the foreign student issue, on the one hand, and the minority issue, on the other hand. It's never quite to the extent that you see in the conflict in Washington, DC, and other places between the black community and Asian shopkeepers. But almost every description I've seen of what's happening to the minority population at the graduate level talks about decreases and then throws in that during the same period of time, there has been an x percent increase in foreign students. In a direct sense, it's difficult to see that these are related. But in an indirect sense, there is a question of resource allocation in institutions. Where are the resources going when you get an increasing number of foreign students? That means you build an infrastructure, support services, and so forth. What happens with minority students?

The foreign students come with money from their families and other sources—so, it's not a question of putting out university funds for direct support. In the sciences and engineering—which are the areas where there are real shortages of minority students—Asian students, particularly, are going like gang busters. They usually come over with very high math scores.

From talking to colleagues around the country, they are very happy with the laboratory and classroom performance of foreign students. But the teaching assistant question is a difficult one. Usually, when you get into it in depth, it's not simply a language problem, but a culture problem, very often in understanding how American classrooms work. But I think people are really trying to do something about that. The Council is going to try to serve as a national clearinghouse on information to try to help people out as they look at this issue.

Study of Master's Degree

SGR. *How reliable is the information about minority enrollments?*

Lapidus. The data are really terrible. We're making a new enrollment survey, and we're asking for more information than anybody has on minorities. We're splitting Hispanics into three subgroups: Puerto Rican, Mexican-Hispanic, and other Hispanic.

We're also in the preliminary stage of a national study of the master's degree in the US, what it has become, and how it's used, and what we think makes good sense in master's education. It would be used as a guideline for institutions, for state controlling boards, and so on. The way we view quality in master's programs is to judge them as mini-PhD programs, which they are not. We say that if a program isn't producing any scholarship or research, obviously it's a lousy program. I think we have to look at the master's degree in its own terms. It's a massive subject. There are at least 800 different master's titles, some given only in one place. The two big degrees are the old ones, the MA and the MS. Many people feel those are an anachronism today. What do you do with those degrees? Most of those degrees have been on the way to a PhD. Then you have the classic sort of practice degrees, the MBA, the MSW, the MFA. Then you've got a whole slew of other degrees, sometimes combinations of things, like Master of Arts in Vocational Rehabilitation Counseling. A lot of it is aimed at a marketplace.

Mathematics: Outcry Against Boom in DoD Funds

With about $48 million for mathematics research in universities this year, the Pentagon is second to NSF's $55 million. But DOD is growing faster than NSF in mathematics, which is just now recovering from long fiscal neglect. The national math societies are cheering DoD on to give even more. But some mathematicians are becoming concerned about their discipline's expanding links with the military. The concern is strikingly expressed in an article in the January issue of ***Notices*** *of the American Mathematical Society by Professor Bill Thurston, of the Princeton University Mathematics Department.*

Thurston's statement is described as having been "commissioned" by a group of fellow mathematicians for mobilizing support for expanding civilian rather than military funding for mathematics. Following are excerpts.

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We are all aware of deserving mathematicians who are denied NSF support for their research because money is scarce. We know mathematicians who have recently turned to the military, and others who are resisting acceptance of military funding . . . . Repeatedly, people approach me with opportunities for military funding. I have not chosen to take that route. More than one person has criticized me, on ethical grounds, for *not* accepting military funding . . . .

It is a dangerous reversal of the proper relationship between military and civilian life when control of civilian enterprises is funneled through the military. This reversal has taken place in fields not far from mathematics. It is difficult for students in many places to *avoid* working on military projects. In places like MIT, graduate students in physics routinely shuttle between summer jobs doing true military research at the affiliated military laboratories, and general research funded by the military on the campus.

In computer science, the major departments are the ones that have a good relation with the Defense Advanced Research Projects Agency (DARPA). According to an Association for Computing Machinery report . . . a survey showed that in the four top departments, the NSF support per faculty member in 1985 averaged $31,000, while that from the Department of Defense averaged $279,000. Such a department is in effect owned by the military . . . . The military funding has emphasized applied research at the expense of theoretical research. In important areas of research, such as . . . very large-scale integration . . . the influence is so strong that information exchange is primarily at military conferences, not in journals. The information is available only to insiders . . . .

Military funding is frequently not managed for the good health of science. First, although the decision process varies among military agencies, it often involves much less expert and disinterested outside input than the process in NSF . . . . Personal relationships, rather than the quality of research, may determine research grants . . . . Second, the research funded by the military must be justified by military needs, not just scientific interest. At the 1986 mathematics chairmen's day [sponsored by the National Academy of Sciences Board on Mathematical Sciences], Arthur Wouk of the Army Research Office described the mission of the ARO program in mathematics: shock, blast, and penetration. His frankness is to be commended; it is not the ARO that set these goals, but the Army research labs and the generals . . . .

The narrowing of goals stemming from mission-directed research saps the health of mathematics . . . . Mission-directed research prevents us from wandering where our interests lead. If one compares the tremendous intellectual breadth of research supported by the NSF mathematics division to that supported, with a comparable total budget, by the military agencies, it is clear that the ratio of ideas per dollar is far larger for NSF . . . .

The combined mathematical societies, through the Joint Policy Board on Mathematics (JPBM) . . . . have been sponsoring a strong effort in the Pentagon and in Congress to persuade them to increase federal support, and in particular, military support, for research in mathematics. Their effort has been effective. The JPBM has solicited grants from DARPA for funding of mathematics awareness week . . . . The JPBM and the Board on Mathematical Sciences selects and solicits mathematicians to testify before Congress and speak to the press; they explain that we need to express a single message, spoken with one voice . . . .

There has been opposition within the AMS to discussion of the wider issues associated with military funding . . . . The AMS should take a position in the JPBM and instruct its agents not to promote military funding, and it should make a policy decision not to participate in military grants. The Board on Mathematical Sciences, an arm of the National Research Council and National Academy of Sciences, should stop acting as a marketing agent for military funding programs.

When a consensus can be reached, the AMS should take the further step of advocating decreased military funding, taking particular care to find appropriate alternate funding for fields which have traditionally depended on military support.

To the Editor: AAAS Defended in Magazine Demise

The coverage of the demise of *Science86* in SGR has been outstanding, but I do feel that the use of the phrase "needless scuttling" (Nov. 15, Dec. 15) is unfair to the American Association for the Advancement of Science.

By my estimates, *Science86* lost a total of $20 million [since it began publication in 1979]. If one estimates that the actual revenue of the AAAS in 1985 (the last full year of *Science86*) was about $35 million, then the total accumulated losses were 57 percent of the year's revenue.

The 1985 revenue of Time Inc. (the owner of *Discover,* for whose use the *Science86* subscription list was purchased) was about $3.4 billion. If *Discover* had lost the same percent as *Science86*, it would have amounted to $1.9 billion. I do not think that terminating a magazine that had lost this amount would have been called "needless." Yet the figure is proportionally equal to the losses incurred by *Science86.*

Science86 was a money loser from beginning to end. Published financial statements in *Science* magazine through 1983 show that *Science86* was never in the black, even without including substantial overhead. I have no doubt that if the statements were available for subsequent years, they would be as bad or worse.

If the magazine had continued publication, there was no future but a sea of red ink. It is, of course, possible that the situation could have been turned around, but I think they might as well have put their money in lottery tickets. The odds were unimaginably high against success, and the only realistic decision was to sell.

If I could fault the AAAS at all, it would be for not selling *Science86* sooner.

E. G. Sherburne Jr.
Director,
Science Service

(Ed. Note: That *Science86* could have been kept alive and well is strongly suggested by a distinguished general science magazine that is flourishing on a modest budget—*The Sciences,* the bimonthly published by the New York Academy of Sciences since 1961. With a circulation of 73,000, and an annual budget of $700,000, it is in the black through an assignment of $7.50 from the annual dues of $55 from each of the Academy's 52,000 members, plus newsstand sales, non-member subscriptions, and a small volume of ad revenues.

The Sciences' editorial quality and graphics are first-rate, and many close watchers of the recent proliferation, and decline, of popular science periodicals consider it the best in the field. Its circulation is only one-tenth that of the late *Science86,* but it is growing healthily and inexpensively, in contrast to the AAAS magazine's financially ruinous direct-mail campaigns to build circulation so as to attract ads—which failed to arrive to pay the bills.

With 135,000 members, and substantial profits from *Science,* the AAAS could have pared down the costs of the high-spending *Science86* and kept it alive. It could have appealed to the readers for higher subscription fees. It could have sought assistance from science-minded foundations. It could have accepted and made up the losses as a proper function of a non-profit science organization; after all, many activities within the AAAS are not profitable. Instead, the needless scuttling.

Sherburne modestly omits reference to the growing success of the publication he heads, the weekly *Science News,* $29.50 per year, and little advertising. Over the past year, its circulation has risen from 179,000 to 216,000.)

Science Gains in Newspapers

While an advertising drought has riddled the ranks of slick pop-science magazines, the number of regular science sections in daily newspapers has tripled to over 60 during the past two years, according to the Scientists' Institute for Public Information.

SIPI, a New York-based non-profit that seeks to assist science journalism, defines a weekly science section as at least a page and a half of science and medical articles that appear on the same day every week in a specially defined space. SIPI reports that the number of newspapers with such sections rose from 19 in 1984 to 66 last year, with total circulation of 11.5 million. In addition, it said that 81 daily papers have weekly science pages.

The apparent success of newspaper science amid the difficulties of the magazine version is related to the peculiarities of advertising placement. Many of the newspaper sections thrive as attractive outlets for ads by local computer stores and local educational institutions. The big pop science magazines, such as the late *Science86* and *Science Digest,* suffered from Madison Avenue's conviction that their audiences are too diffuse and not rich enough to give good value to advertisers. Time Inc.'s *Discover,* the sole survivor in this genre, is trying to make a go of it, but the outcome is far from clear.

What's odd about all this is that in sheer numbers, the audiences are there, as is evidenced by the boom in newspaper science sections and the hefty circulations of the departed magazines—well over half a million each. The ruinous factor for the magazines was not editorial quality, which was usually pretty high. Rather, it was the advertising industry's negative assessment of their value for selling consumer goods.

In Print: Export Controls, Health Goals, Physics

The following publications are obtainable as indicated in the boldface headings—not from SGR.

From National Science Teachers Association, 1742 Connecticut Ave. NW, Washington, DC 20009; 202/328-5800.

Teacher Certification Information Kit, describes NSTA's newly launched program to establish national standards of certification for science and mathematics teachers from kindergarten through high school.

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From US Public Health Service, Office of Disease Prevention and Health Promotion, Information Center, PO Box 1133, Washington, DC 20013-1133; tel. 202/429-9091.

The 1990 Health Objectives for the Nation: A Midcourse Review (252 pages, $3.00), reports on progress in the 10-year program of 226 national health objectives adopted by the PHS in 1980. Major categories include high blood-pressure control, family planning, immunization, accident prevention, and nutrition. On schedule with many items, the report says, but not so with some important ones, including teen-age pregnancy, control of sexually transmitted diseases, obesity, illicit drug use, and violent behavior.

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From Gale Research Co., Book Tower, Detroit, Michigan 48226; tel. 313/961-2242.

Research Centers Directory, 1987, 11th edition (two volumes, 1770 pages, $355 per set), lists 9200 research units in US and Canadian universities, government agencies, industrial organizations, etc., including nearly 1000 added since the last edition. Each entry includes full title of organization, name of director, address, telephone number, size of staff, and research interests.

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From Deputy Under Secretary for Trade Security Policy, Room 2E518, Pentagon, Washington, DC 20310-2700; tel. 202/697-9347.

The Technology Security Program, a report to Congress (83 pages plus appendixes, no charge). Aloof from reality, this report by Defense Secretary Weinberger boasts success in throttling sensitive exports to the Soviet bloc, a goal that he says "unites Republicans and Democrats, Congress and the Administration." Left unmentioned is that the unity is mainly against the Pentagon cranks who would stifle all commerce rather than let the Russians get a Radio Shack computer. A flock of independent studies shows that DOD's Technology Security Program mainly shifts sales from hamstrung American exporters to their delighted foreign competitors.

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From Superintendent of Documents, USGPO, Washington, DC 20402; tel. 202/783-3238.

Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives (GPO Stock No. 052-003-01056-9, 88 pages, $4.00), prepared by the Congressional Office of Technology Assessment at the request of the Senate Appropriations Committee, this report is the 37th in OTA's series of Health Technology Case Studies. It concludes that "within their areas of competence," these health-care professionals "provide care whose quality is equivalent to that of care provided by physicians." The report states that the nurse practitioners and certified nurse-midwives "are more adept than physicians at providing services that depend on communication with patients and preventive actions." OTA adds that the physician assistants "also perform better than many physicians in supportive-care and health promotion." OTA concludes that the three groups, now totaling about 35,000, "have not been used to their fullest potential" because of restrictive reimbursement policies.

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From American Institute of Physics, Public Information Division, 333 E. 45th St., New York, NY 10017; tel. 212/661-9404.

Physics News in 1986 (70 pages, $5.00 per copy, less for larger orders), covers last year's major developments in 16 fields, from astrophysics to vacuum physics. Worth considering for supplementary use in high school and college classes.

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From Commission on Professionals in Science and Technology, Suite 831, 1500 Massachusetts Ave. NW, Washington, DC 20005; tel. 202/223-6995.

Manpower Comments (32 pages, 10 times a year, $7 per copy, $65 for one-year subscription), produced by what was formerly called the Scientific Manpower Commission, this publication reliably condenses useful information about R&D manpower, budgets, policy developments, etc. from scores of reports, professional periodicals, and news publications.

Science & Government Report
Northwest Station
Box 6226A
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